were rejected under 35 U.S.C. 103(a) as obvious over Nikitin et al. (US 4,429,244) and Andersson et al. (US 3,670,192); Claim 17 was rejected under 35 U.S.C. 103(a) as obvious over Nikitin et al. and Andersson et al.; Claim 21 was rejected under 35 U.S.C. 103(a) as obvious over Nikitin et al. and Andersson et al., in further view of Auclair (US 5,429,532); Claim 23 was rejected under 35 U.S.C. 103(a) as obvious over Nikitin et al. and Andersson et al., in further view of Elton et al.'165 (US 5,036,165); and Claims 24 and 25 were rejected under 35 U.S.C. 103(a) as obvious over Nikitin et al. and Andersson et al., in further view of Simmons et al. (US 4,997,995).

Claims 16 and 18-20 were indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim. Applicants have amended these claims as indicated and are thus believed to be in allowable form.

In response to the rejection of Claim 22 under 35 U.S.C. 112, 1st para., Claim 22 has been amended to specifically describe that the windings are clamped together (see specification at page 5, lines 20-21). The rejection of Claim 22 under 35 U.S.C. 112, 1st para. is therefore believed to have been overcome.

Prior to a discussion on the merits, a brief review of Applicant's invention may be helpful. The present invention is directed to a rotating electric machine for high-voltage operations. The machine includes a set of windings having high-voltage cables that enclose an electric field in the set of windings. The claimed machine also includes an elongated member of an electrically conductive material connected to ground and connected to the set of windings, and is disposed in the end winding region so as to suppress the electric field in the end winding region.

As discussed in the specification at page 2, lines 17-23, in the end winding region of conventional machines, it is not possible to insert non-insulated conductive material due to

strong electric fields. However, according to the present invention, the electric field in the end winding region is reduced to zero or close to zero due to the grounded outer-semiconducting layers of the cables constituting the windings, which make fault control possible. Therefore, any arc due to an internal fault in the end winding region will be directed to ground via the fault-current control device and thus damage to the end winding region is reduced as compared with conventional devices.[1]

In paragraph 12 of the outstanding Office Action, the outstanding Office Action explains that the arguments made with regard to Claims 13-15, 21 and 26 are not related to the "claimed features". While Applicants do not share this view, Claim 13 has nevertheless been amended to describe structural functional differences between the claimed invention and the asserted prior. In particular the elongated member is defined as being an electrically conductive material being connected to ground and connected to the set of windings. Connecting the set of windings to ground with an electrically conductive material will ground the outer surface of the windings. Because the outer surface of the windings is grounded, the set of end windings in the end winding region have their electric field suppressed in the end winding region.

Nikitin et al is directed to a completely different device, where in the end winding region, as seen in Figure 4, high-voltage element 6, have no insulation in the end winding region Nikitin et al relies on the half windings 8 to be insulated from all zero potential surfaces, and thus places half windings 8 in insulation sleeves 14.[2] The current layers 24 make is possible to produce slightly non-uniform electric fields that eliminate the possibility of a flow of current from the surfaces of the elements 6 to the nearest metal surface of the

---

[1]See e.g., specification page 4, lines 1-3.

[2]Nikitin et al, col. 3, lines 46-56.

stator.[3] Thus, Nikitin et al does not ground the windings as is the case with the invention defined by Claim 13, and thus does not suppress an electric field in the end winding region, which is the case with the presently claimed invention.

The outstanding Office Action (paragraph 12) explains that the insulation sleeve provided by Nikitin et al is in essence, the element of fault current control. However, this does not address the specific structural requirement of having an elongated member of an electrically conducting material that is connected to ground and connected to the set of windings. Thus there are significant structural and functional differences between Nikitin et al and the invention defined by amended Claim 13.

Andersson is directed to a device, that recognizes that the amount of insulation in an end winding region is inferior to that of insulation within the stator (column 1, lines 42-47). Furthermore, Andersson recognizes that putting a conductive material in the end winding region, will certainly cause a failure of the insulation of the winding in the end winding region (see e.g., lines 54-55). To address this, Andersson only places a conducting layer of material such as a varnish, at places that are "near to any machine part" and placed at "a certain distance from the winding slot." This conducting layer then is connected to a voltage-dependent impedance (see e.g., column 1, lines 65-71). When configured this way, the potential on the conducting layer during normal operations deviates only negligibly from the conductor potential at the coil side. (See e.g., column 2, lines 44-46.) However, during a high voltage test, the resistance of the impedance drops so that there is no "increase in the potential of the layer 9" in relation to ground and consequently the risk of an arcing during testing is reduced. (See e.g., column 2, lines 51-55). Thus, there is no teaching or suggestion of actually connecting a surface of the winding in Andersson directly to ground, but simply

[3] Nikitin et al, col. 3, lines 46-56.

maintaining a potential on an outer surface of the winding (conducting surface 9) via a impedance element 8, so as to avoid arcing to a machine part 7, when operated at testing voltages.

Thus, the resistor provided by Andersson does not perform the claimed function, of connecting the set of windings to ground so as to suppress the electric field in the end winding region, but rather to maintain a predetermined potential (which is not zero) on the surface 9 in Andersson.

Consequently, in view of the above discussion, it is respectfully submitted that no matter how Nikitin et al is combined with Andersson, the combination does not provide the structural and functional requirements presently claimed in Claim 13. Furthermore, the combination of Nikitin et al in view of Andersson does not disclose an elongated member of an electrically conducting material (neither a resistor 8, in the case of Andersson, nor the insulation sleeves 14 of Nikitin et al, are the same or equivalent to an electrically conducting material that is connected to ground). Claim 13 further requires that the elongated member connect to ground and connect to the set of windings so as to suppress the electric field in the end winding region. However, Nikitin et al does not ground the conductive element 6 at all, and Andersson purposely includes an impedance, not a conductive element, so as to maintain a potential on an outer surface of the conductor, but not grounded. Consequently, it is respectfully submitted that neither Andersson nor Nikitin et al, nor any combination thereof teach or suggest all the elements of Claim 13 and therefore do not render obvious the invention defined by amended Claim 13. Since Claims 14-15 depend from Claim 13, it is respectfully submitted that Claims 14-15 also patentably define over Nikitin et al in view of Andersson.

Claim 26 includes a claim element that was drafted to invoke an interpretation under 35 U.S.C. §112, sixth paragraph. Namely, this claim element is "means for controlling a fault current and for conducting said fault current to ground in an electric winding region of said set of windings so as to suppress the electrical field in the end winding region." Since the scope of a claim element drafted under 35 U.S.C. §112, sixth paragraph depends on the structure, materials and acts disclosed in the specification, it is necessary to refer to the specification. The specification specifically describes a cable, with a semiconductive outer surface (page 1, line 15) and page 2, lines 19-23). Connected to ground in an end winding region by various elongated members such as members 10, shown in Figure 2. As discussed above, neither Nikitin et al nor Andersson teach or suggest the same or an equivalent means for controlling a fault current, consistent with the invention defined by Claim 26. Consequently, it is respectfully submitted that the invention defined by amended Claim 26 patentably defines over any combination in view of Andersson.

Claim 17, stands rejected as being unpatentable over Nikitin et al in view of Andersson. However, Claim 17 depends from Claim 13, and as discussed above, Claim 13 is believed to patentably define over Nikitin et al and Andersson. Consequently, it is respectfully submitted that Claim 17 also patentably defines over Nikitin et al in view of Andersson.

Claim 21 is rejected as being unpatentable over Nikitin et al in view of Andersson et al and in view of Auclair. Auclair is merely asserted for its disclosure of a cable fault control device having a conventional flexible wire 16 or 18 that may serve as a ground connector. However, it is respectfully submitted that the ground clamp shown in Auclair will be of relatively little utility in the devices of Nikitin et al and Andersson, which fail to contain an electric field in the end winding portions of the rotating machine. Failure to contain the

electric field in the end winding portion, will give rise to failure of the machine, as discussed in the present specification at page 2, lines 16-20. Thus it is respectfully submitted that no matter how Nikitin et al, Andersson and Auclair are combined, the combination does not teach or suggest the invention defined by Claim 21.

Claim 23 stands rejected as being unpatentable over Nikitin et al in view of Andersson and Elton.

Claim 23 stands rejected as being unpatentable over Nikitin in view of Andersson and Elton. Elton is asserted for its teaching of the high-voltage flexible cable having a current carrying conductor. Elton is actually a divisional patent of U.S. Patent No. 4,853,565 (Elton '565), which provide a more complete explanation of the device disclosed therein. Elton '565 (and also Elton) is directed to a device that uses pyrolyzed glass fiber layer for various insulated electrical conductors (see, e.g., title and abstract). As discussed in the background section, Elton '565 uses pyrolyzed glass because conventional grounding tapes for "heavily insulated electric or windings or armature bars" (column 1, lines 21-22 and 60-62), may become abraded due to vibrations of the armature bar in the stator slot. Elton '565 identified a pyrolyzed glass fiber tape that would be wrapped around different types of conductors (e.g., the winding embodiment of Figures 1-6, the power cable embodiment of Figure 7, and the housing embodiment of Figure 8). One of the embodiments in which the pyrolyzed glass fiber layer is used, is a conventional armature bar that as that shown in Figures 1-6 for example. Elton '565 describes in this embodiment that the conductors are windings in an electric machine and uses the terms "armature bars" or "electrical windings" (column 5, lines 64-65) to describe these conductors. However, another embodiment that uses the pyrolyzed glass fiber layer is a power cable shown in Figure 7, where the power cable uses a semiconducting pyrolyzed glass fiber layer to equalize electric charge on the exterior of the

cable. Elton '565 does not interchange the use of the terms "cable" (embodiment No. 2) for "armature bars" or "electrical windings" (embodiment No. 1). There is no teaching or suggestion that one of ordinary skill in the art would have substituted the cable of the embodiments of Figure 7 for the armature bars or windings of the embodiments of Figures 1-6.

In view of the differences in operation between conventional armature bars and windings that use a pyrolyzed glass tape, and a power cable that uses pyrolyzed glass tape, it is respectfully submitted that one of ordinary skill in the power engineering art would not have been motivated at the time the invention was made to substitute the power cable for the winding since the prevailing thought at the time that the cable wound electric machines would not operate successfully at high-voltages. Furthermore, Elton '565 itself does not teach or suggest the substitution, but merely provides yet another indication that those of ordinary skill in the power engineering art would recognize windings as being a different field of endeavor than power cables.

While the outer surface of the power cable in Elton '165 as discussed above is shown to be grounded, Elton '165 is actually a divisional application based on Elton '565, which explains that the power cable embodiment is a completely separate embodiment than the rectangular winding embodiment of Elton '565. Accordingly, it is respectfully submitted that there is no teaching or suggestion in Elton '165 that the power cable, which is grounded, as shown on the cover figure, may be used in a dynamo electric machine as a winding.

Consequently, in view of this discussion it is respectfully submitted that one of ordinary skill in the art would not have been motivated to substitute the power cable of Elton for the windings in Nikitin and Andersson as asserted. Accordingly, it is respectfully submitted that Claim 23 is not rendered obvious by the asserted combination.

Claims 24 and 25 stand rejected as being unpatentable over Nikitin in view of Andersson and Simmons. Simmons is asserted for its discussion of the method of making an extra high-voltage flexible cable with the reduced insulation. However, the cable in Simmons is not grounded and thus because neither the devices in Nikitin and Andersson contain the electric field and are not grounded, and the device in Simmons is not grounded it is respectfully submitted that no matter how the asserted references are combined, the asserted combination does not teach or suggest the invention defined by Claims 24 and 25 which require elements of a set of windings that enclose an electric field and also require a fault control device having an elongated member connected to ground and connected to the end winding region. Accordingly, it is respectfully submitted that Claims 24 and 25 patentably define over the asserted prior art.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 13-26, as amended, is enabled by the specification and patentably distinguishing over the prior art. The present application is therefore believed to be in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND
MAIER & NEUSTADT, P.C.

Gregory J. Maier
Attorney of Record
Registration No. 25,599
Bradley D. Lytle
Registration No. 40,073

22850

(703) 413-3000
Fax #: (703)413-2220

Marked-Up Copy
Serial No: 09/297,570
Amendment Filed on:
SEPTEMBER 24, 2001

IN THE CLAIMS

Please amend Claims 13, 16, 18, 22, and 26 as follows:

13. (Twice Amended) A rotating electric machine for high-voltage operation, comprising:

a stator;

a rotor disposed within said stator;

a set of windings having high-voltage cables that enclose an electric field in the set of windings, said set of windings having an end winding region; and

a fault current control device including,

an elongated member of an electrically conducting material connected to ground and to said set of windings, and disposed in the end winding region so as to suppress the electric field in the end winding region.

16. (Twice Amended) [The rotating electric machine of Claim 13, wherein:] A rotating electric machine for high-voltage operation, comprising:

a stator;

a rotor disposed within said stator;

a set of windings having high-voltage cables that enclose an electric field in the set of windings, said set of windings having an end winding region; and

a fault current control device including,

an elongated member of an electrically conducting material connected to ground and disposed in the end winding region, wherein

said elongated member being slotted so as to reduce eddy-current losses.

18. (Twice Amended) [The rotating electric machine of Claim 13,]A rotating electric machine for high-voltage operation, comprising :

a stator;

a rotor disposed within said stator;

a set of windings having high-voltage cables that enclose an electric field in the set of windings, said set of windings having an end winding region;

a fault current control device including,

an elongated member of an electrically conducting material connected to ground and disposed in the end winding region; and [further comprising:]

a spacer made of resilient, electrically conducting material, said spacer being applied between high-voltage cables in the end winding region and positioned to contact respective outer semi-conducting layers of the high-voltage cables.

22. The rotating electric machine of Claim 13, wherein:

said fault current control device being configured to [mechanically stabilize] clamp the set of windings together in the end winding region.

26. A rotating electric machine for high-voltage operations, comprising:

a stator;

a rotor disposed in said stator;

a set of windings having high voltage cables enclosing an electric field within the windings; and

means for controlling a fault current and for conducting said fault current to ground in an end winding region of said set of windings <u>so as to suppress the electrical field in the end winding region</u>.

I:\atty\BDL\9847\98470009.am4.wpd